LLNL Environmental Restoration Division Standard Operating Procedure	TITLE: Well Disinfection and Coliform Bacteria Sampling
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APPROVAL **Date** _____ _____ **Division Leader** **CONCURRENCE** **Date** _____ _____ **QA Implementation Coordinator**	**PROCEDURE NUMBER:** **ERD SOP-2.10** **REVISION: 0** **EFFECTIVE DATE:** **December 1, 1995** **Page 1 of 4**

*Operations and Regulatory Affairs Division

1.0 PURPOSE

To describe a chlorination procedure to disinfect monitor wells prior to collecting ground water samples that will be analyzed for coliform bacteria as recommended in Appendix C of the manual, "*Water Well Standards: State of California."*

2.0 APPLICABILITY

This procedure is applicable to the disinfection of monitor wells prior to sampling for total and fecal coliform bacteria.

3.0 REFERENCES

3.1 Driscoll, G. F. (1986), *Groundwater and Wells*, Second Edition, Johnson Division, St. Paul, Minn.

3.2 Lamarre, A. L. (1989), *Sampling and Analysis Plan for Coliform Bacteria in Water From Selected Site 300 Monitor Wells*, Memo, Lawrence Livermore National Laboratory, Livermore, Calif.

3.3 State of California Department of Water Resources Agency (1981), Appendix C, Manual, "Water Well Standards: State of California," Sacramento, Calif.

4.0 DEFINITIONS

4.1 Well Disinfection

Each well that is designated as part of the network to be sampled for total and fecal coliform bacteria must be disinfected prior to sampling. These wells will be disinfected by using a disinfectant containing at least 100 mg/L of available chlorine.

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Field Personnel

The field personnel are responsible for performing all field activities in a safe and efficient manner according to guidelines established herein, as well as associated SOPs.

5.3 Field Support Personnel

The field support personnel are responsible for providing necessary equipment, collection devices and general field support which enables personnel to perform field activities in a timely and efficient manner.

5.4 Sampling Coordinator (SC)

The SC's responsibilities are to supply a quarterly Routine Ground Water Sampling Schedule, which includes the wells to be sampled for coliform bacteria, and perform all preparatory work prior to collecting the samples.

6.0 PROCEDURES

At the direction of the SC, the designated wells are disinfected in preparation for coliform bacteria sampling. The wells are disinfected to remove any bacteria within the well casing. Each well will receive a dose of chlorine solution containing at least 100 mg/L of available chlorine. A calculation will be made to determine the appropriate amount of chlorine to add based upon the amount of water standing in the well casing.

6.1 Office Preparation

6.1.1 The wells to be sampled for coliform bacteria will be included in the quarterly Routine Sampling Schedule provided by the SC. Prior to sample collection, all calculations will be made and appropriate chlorination performed.

6.1.2 A 5.25% sodium hypochlorite solution (standard household bleach) is routinely used. The U.S. EPA recommends using a solution with a minimum concentration of 100 mg/L of available chlorine for proper sterilization. The following formula is used to calculate the quantity of sodium hypochlorite:

Volume hypochlorite (gal) = (W) (R/S)

where

W = water volume in well (gal),

R = required hypochlorite concentration in the well (decimal), and

S = sterilant concentration (decimal).

6.1.3 When using the above equation, both required and sterilant concentration should be in decimal form. For example: 100 mg/L = 100 ppm = 100/1,000,000 = 0.0001; percent available chlorine of 5.25% = 0.0525. The volume (gal) is the amount of water in the well casing (casing volume) and is calculated as per ERD SOP 2.1, "Presample Purging of Wells." These calculations should be documented in the sampling logbook and appropriate field forms.

6.1.4 The SC should inform the contract analytical laboratory ahead of time to allow for preparation when collecting samples on a rush turn-around time.

6.2 Field Preparation

6.2.1 In consultation with the SC and field support personnel, ensure that adequate containment devices are available at the well head for purge water collection. The quantity of purge water to be collected for each well is listed in the Routine Sampling Schedule.

6.2.2 Ensure that an adequate amount of 5.25% sodium hypochlorite (Clorox) is on hand, according to the calculated dosages of the required solution.

6.2.3 Ensure the availability of a pool test kit with the appropriate solution to test for chlorine in water which measures in the ppm range.

6.3 Operation

6.3.1 Add the calculated amount of 5.25% sodium hypochlorite to the well. Use the pump to recirculate the water to ensure thorough mixing of the disinfectant with the well water. Turn the pump on and off several times during this procedure. The pumping should be repeated several times at one-hour intervals to adequately mix the disinfectant.

6.3.2 After disinfection, the water in each well will be allowed to stand for 24 hours. After 24 hours the water should be pumped until the presence of chlorine is no longer detectable. Test for the presence of chlorine by using a pool test kit according to manufacturers instructions. Once the water is free of residual chlorine, a coliform bacteria sample may be collected in a 250 ml pre-sterilized polyethylene container as described in ERD SOP 4.3, "Sample Containers and Preservation."

6.4 Post Field Operation

6.4.1 Before leaving the sampling site, cross check sample containers with those recorded in the logbook.

6.4.2 To maintain and document sample custody, follow the procedure for completing a Chain-of-Custody form in SOP 4.2, "Sample Control and Documentation."

6.4.3 After all samples are collected and preserved as necessary, any non-dedicated sampling equipment should be decontaminated prior to sampling another site in order to prevent cross-contamination of equipment between locations (see SOP 4.5, "General Equipment Decontamination").

6.5 Office Post Operation

6.5.1 Deliver all field logbook notes, Ground Water Sampling Logs, and Chain-of-Custody forms at least once a week to the SC. Submit photo copies of all associated paperwork on a daily basis.

6.5.2 The SC will retain a copy of the original forms (CoC, ground water sampling log), and provide the originals to the Data Management Group (DMG) for final archive. The DMG will provide copies of the forms to the appropriate Operations and Regulatory Affairs Division Analyst, as necessary.

6.5.3 Submit the coliform samples to the analytical laboratory as soon as possible due to the short holding time for coliform analyses (6 hours).

7.0 QA RECORDS

7.1 LLNL Ground Water Sampling Logs

7.2 Logbooks

8.0 ATTACHMENTS

Not applicable.